

CGAHR Update

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Spring 2010 Issue

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Welcome to the Center for Grain and Animal Health Research. Yes, GMPRC is now CGAHR. There were two main reasons for the change: we haven't done much "marketing" research since two Economic Research Service positions were closed in the 1970s, and the Arthropod-Borne Animal Disease Research Laboratory has been relocated from Laramie, Wyoming to Manhattan. This group's research was not reflected in our old name. We have undergone many other changes, and this seemed like a great opportunity to adjust our name to more fully describe what we do.

Among the changes, we have one new Research Unit (ABADRU moving from Laramie) and three Unit names have changed in the past two years. Most recently, the Plant Science and Entomology Research Unit has become the Hard Winter Wheat Genetics Research Unit (HWWGRU). The new name more accurately reflects the mission of the Unit, and will make it easier for customers to find specific research on protecting hard red and white winter wheat from biotic and abiotic stresses. Last year the Engineering Research Unit and the Wind Erosion Research Unit merged to become the Engineering and Wind Erosion Research Unit (EWERU). The Biological Research Unit re-branded itself as the Stored Product Insect Research Unit (SPIRU).

On July 28, 2009, we held our first Research Partners Meeting. The meeting was hosted by the Kansas Farm Bureau and held at their facility in Manhattan, Kansas. We heard many good ideas (like improving this newsletter and renaming the Center), and appreciated the feedback on our research programs.

The following pages will "Update" activities and achievements at CGAHR.

Meetings/Conferences

Myrna Miller and Kristine Bennett gave presentations on Rift Valley Fever (RVF) research at the Rift Valley Fever Workshop: An Integrated Approach to Controlling Rift Valley Fever in Africa and the Middle East, in Cairo, Egypt, January 2009.

James Mecham and Barbara Drolet gave presentations on RVF virus diagnostic research at the annual American Society for Virology Conference in Vancouver, BC, Canada, 2009.

Barbara Drolet, James Mecham, and William Wilson gave several presentations on RVF and bluetongue research during the Foreign and Emerging Diseases Committee Meeting, Bluetongue Committee Meeting and ARS Research Symposium – Integration of Veterinary Medicine and Entomology meeting at the annual USAHA Conference in San Diego, October 2009.

Barbara Drolet presented, “Effects of Viral Infection on Blood-Feeding Behavior in *Culicoides sonorensis* (Diptera: Ceratopogonidae)” for Kristine Bennett at the West Central Mosquito and Vector Control Association annual meeting in Rapid City, SD, February 2009.

Research on RVF vaccine evaluation and related diagnostics, funded by the Department of Homeland Security, has begun at the Canadian Food Inspection Agency’s high biosecurity research facility in Winnipeg.



Kristine Bennett presented “Biting Midges: Current Status and Trends,” an invited symposium lecture at the Livestock Insect Workers Conference in French Lick, IN, June 2009.

Kristine Bennett and Melissa Stuart gave presentations on *Culicoides* midge research at the West Central Mosquito and Vector Control Association’s annual meeting in Fort Collins, CO, February 2010.



William Wilson will be traveling to Nairobi, Kenya, to work with collaborators at the Kenya Agricultural Research Institute and the Kenya Diagnostic Veterinary Services to do field evaluations of a new test to detect RVF viral RNA. While there, he will be discussing a RVF vaccine project, funded by the Department of State’s Biosecurity Engagement Program, and presenting research at the International Livestock Research Institute.

Projects

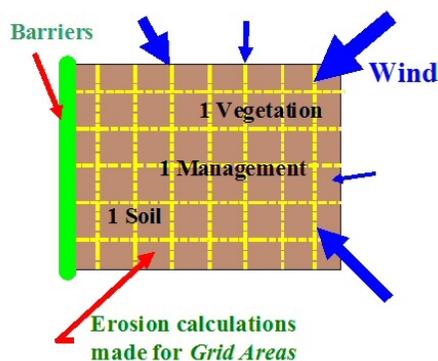
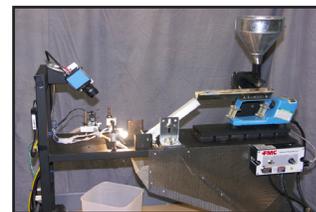
Barbara Drolet and William Wilson have initiated a Non-funded Cooperative Agreement (NFCA) with the KSU Veterinary Diagnostic Laboratory entitled “Development and Evaluation of Diagnostic Applications for Arboviruses.” The long term goal is to develop rapid, reliable and sensitive diagnostic assays for the identification arboviruses, suitable for use in veterinary diagnostic labs and in the field during natural or intentionally caused disease epidemics.

Kristine Bennett, Barbara Drolet and William Wilson have initiated an NFCA with the Division of Biology, KSU entitled “Evaluation of New Molecular Targets to Control Arbovirus Transmission. The long term goal is to identify RNA interference (RNAi) targets to inhibit infection and transmission of mosquito-transmitted animal and zoonotic arboviruses.

A poster has been prepared showing an overview of the Unit’s research mission for the Biosecurity Research Institute’s Open House on April 24, 2010.

Grants

Floyd Dowell will receive funding (\$62,500) from Dow Agrosience for “Applying Single Kernel NIR Sorting Technology to Enhancing Quality of Breeding Lines.” Single kernel NIR sorting technology will be used to select kernels with specific traits to enhance the quality of fixed and segregating breeding lines.



Larry Wagner received a \$105,000 grant through CREES with funds provided by Washington State University for “Incorporation of the Wind Erosion Prediction System (WEPS) within a Comprehensive Regional Air Quality Model. The funds are to be used on a specific cooperative agreement with Kansas State University. They will produce a windblown dust emissions module that can be employed to demonstrate and evaluate the application of WEPS via the AIRPACT-3 regional air quality modeling system. AIRPACT-3 covers the Pacific Northwest states of Washington, Oregon, Idaho and parts of Montana, California, Nevada and Utah. Also, parts of two Canadian provinces, Alberta and British Columbia, are covered. This will be an important improvement for this region and the new WEPS-CMAQ module would be applicable across the U.S. The end results of this work will provide a way to account for dust generated by wind from agricultural cropland within an air quality model. It will also provide a better understanding of the nature and extent of wind generated dust as one of the many potential impacts of agricultural activities upon air quality.

Larry Wagner has received word that his proposal, “Assessing Fugitive Dust Emissions from Department of Defense Activities” has been approved for funding (\$1.78M) by the Strategic Environmental Research and Development Program. Wagner has been in the final stages of revising the scope of work which will be over a four year period in cooperation with the Energy Dynamics Lab in Utah and Kansas State University.

Visiting Scientists

Mobolaji (Sam) Obomowale, a lecturer and researcher from the Agricultural and Environmental Engineering Department, University of Ibadan, Nigeria, worked under the direction of Floyd Dowell. Sam arrived in Manhattan to spend six weeks studying alternative grain storage systems and to develop skills and learn new techniques of grain storage to prevent post-harvest losses. Sam gave a short seminar describing his work in Nigeria where farmers have large losses of stored grain due to temperature, humidity and insect problems. Storage facilities made out of metal or concrete that require electricity are impractical in many areas of Nigeria. Sam has been studying termite mounds as a solution for storage. As part of his research, he plans to construct a Termite Mound Clay Brick Silo with bricks made from termite mound clay using techniques familiar to local farmers.

Chun-Lai Zhang, Associate Professor of the China Center of Desert Research at Beijing Normal University, will be working with the wind erosion side of our unit under the direction of Larry Wagner. Chun-Lai’s research has focused on soil erosion by wind and blown sand. Chung-Lai wanted the opportunity to work with our Wind Erosion Prediction System (WEPS) because of the benefits it will provide for his work in China.

Meetings/Conferences

Floyd Dowell traveled to Ifakara, Tanzania, at the request of the Ifakara Health Institute and the Center for Disease Control for two weeks in December. While there, he helped develop field calibrations and trained field personnel in the near infrared (NIR) procedure that can be used to determine the species and age of malaria vectors. This work was an opportunity to transfer our technology to other disciplines and international agencies to address global health issues. The calibration techniques developed from this work directly contributes to techniques being developed for Engineering and Wind Erosion's grain research.



Floyd Dowell was among thirty U.S. scientists invited to participate in the National Science Foundation (NSF)/Bill and Melinda Gates Foundation's "U.S. – Africa Connections Workshop to Explore Basic Science Research Collaborations for Agricultural Development" in Nairobi, Kenya. U.S. scientists met with African scientists to discuss cooperative research that would address their food security issues. Several projects were identified that relate to Engineering and Wind Erosion's research such as rapid testing for toxins and quality and proper storage technologies.

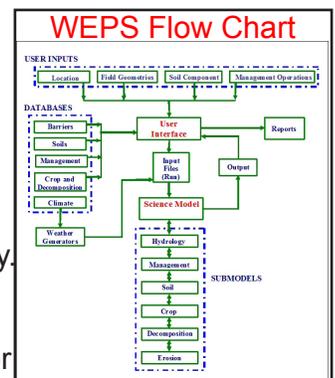
Mark Casada chaired the annual meeting of Multistate Project NC-213, "The U.S. Quality Grains Research Consortium," held in Kansas City, MO, Feb. 3-5. He organized the technical sessions where 21 scientists from eight U.S. universities and two ARS laboratories gave 22 presentations on the status of current research projects. The research projects are based on delivering quality grains, grain products and bioprocess coproducts. The audience of scientists and industry personnel participated in multiple discussions of this research, as well as the needs for future research.

Dennis Tilley reported progress on an Anderson Grant funded research project at CGAHR, "Incidence and Spread of Insects from Bucket Elevator Leg Boots," directed by Casada in collaboration with Kansas State University and the University of Kentucky.

Mark Casada was invited to give two presentations at the Nebraska Urban Pest Management Conference on Feb. 2 in Lincoln. Casada gave talks on "Stored Product Pest Prevention and Grain Aeration" and then on "Discouraging Stored Product Pests through Improved Grain Sanitation." The conference was sponsored by the University of Nebraska and the Nebraska State Pest Control Association. Training was provided for professionals involved in stored grain pest management as well urban pest management.

Larry Wagner was invited by the International Erosion Control Association to present a workshop at the association's annual meeting in Dallas, Texas, February 16-19. Wagner's workshop is "Theory in Practice: Wind Erosion Prediction System (WEPS)." The IECA is a non-profit educational organization serving the worldwide erosion and sediment control industry. This is a unique opportunity to interact with the commercial and private erosion control community.

Floyd Dowell gave an invited presentation "Single Kernel NIR Technology to Enhance the Quality of Wheat Breeding Lines" at the International Association for Cereal Science and Technology (ICC) meeting in Pretoria, South Africa. He also represents the U.S. on the ICC governing committee with other individuals from various countries that guide international cooperative projects.



Grants

Scott Bean, Tom Herald and Jeff Wilson were co-PI's with researchers from Texas A&M and Kansas State University on the grant "Developing Healthy Foods from Special Sorghums." The grant was successfully funded for 1 year by the United Sorghum Checkoff Program. The project will look at unique phenolic compounds in sorghum, starch digestibility and glycemic index of sorghum foods.



Scott Bean and Michael Tilley, along with Chris Little, Kansas State University Plant Pathology, were PI's on the grant that was funded by CSI to study the relationships between grain mold, physiochemical kernel properties and grain quality in sorghum.

Visitors

GQSRU Scientists have been busy with visitors. Numerous visitors such as Dusti Fritz and Jeff Dahlberg from the United Sorghum Check-Off Program; Mark Hodges, CEO of Great Plains Inc.; Justin Gilpin, Executive Director of the Kansas Wheat Board; Jim Frahm, Vice President of the U.S. Wheat Associates and Kansas Legislator Tom Hawk have discussed the latest research that is being conducted in GQSRU and had a tour of CGAHR. Thirty Australian producers also visited CGAHR and enjoyed a tour.

Scott Bean and others, hosted their January meeting for the Kansas Grain Sorghum Producers Association. Their monthly meeting was held at CGAHR on November 9th. Scott Sattler from ARS-Lincoln, was the guest speaker.



Meetings/Conferences

Richard Chen and Brad Seabourn attended the 2009 Kansas Wheat Conference in Wichita, July 30-31, 2009.

Scott Bean, Jeff Wilson, Deidra Blackwell and Tom Herald attended the Sorghum Improvement Conference of North America in Amarillo, TX, August 11-12, 2009.

Jeff Wilson attended the Health, Research & Entrepreneurship: Sorghum Food for Celiac Patients conference held in Naples, Italy, in October 2009.

Scott Bean attended the United Sorghum Checkoff Program Executive Board Meeting in Denver, December 13-16, 2009.



Mike Tilley, Sarah Harmer, Tilman Schober, Richard Chen and Tom Herald attended AACC meeting in Baltimore, September 9-11, 2009.

Tom Herald attended the Agricultural Leadership Breakfast, sponsored by Kansas Farm Bureau, in Hutchinson, KS, September 12, 2009.

Brad Seabourn attended the Plains Grains Inc (PGI) meeting in Lincoln, NE, February 2, 2010. AACC local chapter meeting was held at CGAHR, February 10, 2009.

Margo Caley, Richard Chen, Sarah Harmer, Laura McLaughlin, Brad Seabourn and Michael Tilley attended the 60th Annual WQC Meeting in Kansas City, February 16-18, 2010.

Scott Bean, Deidre Blackwell and Michael Tilley attended the 2010 Pittcon Meeting in Orlando, February 28-March 4, 2010.

Meetings/Conferences

John Fellers attended the International Plant Molecular Biology Meeting in St. Louis, MO, in October 2009.

Guihua Bai attended the 2009 National Fusarium Head Blight Forum in Orlando and **Robert Bowden** attended the National Weed Improvement Committee meeting also held in Orlando in December 2009.

Ming-Shun Chen attended the Entomological Society of America Annual Meeting in Indianapolis, IN.

John Fellers attended the Plant and Animal Genome meeting in San Diego in January.

In March 2010, **Robert Bowden, Guihua Bai, Ming-Shun Chen, John Fellers and Paul St. Amand** attended the Joint Congress of Hard Winter Wheat Workers Workshop National Wheat Genomics Workshop in Lincoln, NE.

Ming-Shun Chen attended the 19th Biennial International Plant Resistance to Insect Workshop in Charleston, SC.

John Fellers attended the North American Rust Workshop in Fargo, ND.

Grants

Dick Beeman was awarded a grant in partnership with the Kansas State University Arthropod Genomics Center for \$84,000, no funds to ARS. The title of the project is “Comparative Genomics of Flour Beetles in the Genus *Tribolium*.” This project will sequence, assemble and analyze the genomes of flour beetles, and use the information to gain insights into genome evolution, gene regulation and gene function.

Visitors

Jan van Someren Graver, a Post-Retirement Fellow with the CSIRO Department of Entomology in Canberra, Australia, visited on August 31, 2009, to discuss current research on control of insects in stored grain. We were saddened to learn of his death a few months after his visit.

SPIRU was visited by Altria Group hosted by Dr. B. Subramanyan from Kansas State University on January 12, 2009. The intent of their visit was to learn about our research and how it might be used to improve pest management in processing facilities.

Nicholas J. Smilanich, the president and CEP of Sensor Development Corporation, visited Jim Campbell and Frank Arthur on February 23, 2010, to discuss potential collaborative research on the development of sensors to detect insect pheromones emitted from infested stored grain.

Students from a Kansas State University class on Stored-Product Entomology visited CGAHR on February 23, 2010, and received a tour of the grain elevator from Dennis Tilley. They met with Jim Campbell to discuss stored-product entomology and to look at cultures of some stored-product insect pests.

Meetings/Conferences

Dick Beeman, Jeff Lord, Brenda Oppert and Kris Hartzler attended the Arthropod Genomics Symposium hosted by Kansas State University in Kansas City, MO, June 2009. Dick Beeman gave a talk “The Strange Case of the Maternal Selfish Gene” and Brenda Oppert presented the poster “Transcriptome profiling of *Bacillus thuringiensis* Cry3Aa intoxication of *Tenebrio molitor* larvae”.

Jim Campbell and Frank Arthur traveled to Greece in June 2009, to meet with collaborators. Frank Arthur presented the seminar “Stored Product Insects and the Urban Environment: A New Frontier” at the Benaki Phytopathological Institute. Jim Campbell presented the seminar “Influence of landscape structure on insect behavior: using neutral landscape models to evaluate how red flour beetles respond to habitat heterogeneity,” at the Agricultural University of Athens. They attended the International Organization for Biological and Integrated Control of Noxious Animals and Plants West Palaearctic Region Section Working Group on Integrated Protection of Stored Products where they served as session co-chairs and made presentations on their research. Frank Arthur presented the talks “Residual efficacy of the insect growth regulator pyriproxyfen for control of stored product insects” and “Stored product entomology: shifting from the past to the future.” Jim Campbell presented the talk “Evaluation of factors impacting trap captures of red flour beetle.”

Jeff Lord gave a presentation at the Annual Meeting of the Society for Invertebrate Pathology in Park City, UT, in August 2009. The title of his presentation was “A Yeast-Like Symbiont of *Tenebrio molitor* and *Zophobas atratus*.”



Jim Throne was invited to give the talk “Efficacy of Fumigants against Psocids, and Other Management Tactics” at the “Methyl Bromide Alternatives Workshop: Focus on ProFume™ and IPM Tactics in the Food Industry” that was held in Manhattan, KS, August 20, 2009.

Frank Arthur attended the semi-annual meeting of Principal Investigators on the USDA-CSREES-RAMP grant “Integrated Post-harvest Rice Management and Information Delivery: Optimizing Insect Control and Grain Quality” held in Jonesboro, AR, October 22-23, 2009. He reviewed current research results and described future research to be conducted as part of this cooperative grant which involves Texas A&M University, the University of Arkansas, Oklahoma State University, Arkansas State University, and Louisiana State University. His presentation at the meeting was “Simulation Modeling for Rice Storage: Practical Applications.”

Brenda Oppert and Michelle Toutges attended a meeting on Bioinformatics and Genomics in Orlando, October 12-16, 2009. Brenda Oppert’s presentation was “The Trials and Tribulations of Blast2Go and NextGen Sequencing.”

Frank Arthur attended a project meeting in Jonesboro, AR, in October 2009. He reviewed current research results and made plans for the future on a grant to Texas A&M University from the Cooperative State Research Education and Extension Service, U.S. Department of Agriculture. This project is a collaborative effort between ARS, Texas A&M University, University of Arkansas, Oklahoma State University, Arkansas State University, and Louisiana State University. His presentation was “Simulation Modeling for Rice Storage: Practical Applications.”

Jim Campbell was invited to speak at the National Pest Management Association meeting held in Las Vegas in October, 2009. The title of his presentation was “Monitoring in Mating Disrupted Environments and Advances in Experimental Monitoring Systems.”



Jim Campbell gave an invited symposium talk, “Pheromone Trapping Red Flour Beetle in Structures: Limitations, Implementation, and Interpretation” to the Entomological Societies of Canada and Manitoba, Ontario, on October 19, 2009. He also visited the Cereal Research Centre of Agriculture and Agri-Food Canada in Winnipeg, where he gave an invited seminar “Evaluation of Fumigation Efficacy in Food Facilities” to the Department of Biosystems Engineering, University of Manitoba.

Jim Campbell and Frank Arthur attended and made presentations at the Methyl Bromide Alternatives and Emissions Conference at San Diego in November 2009. Frank Arthur’s presentation was “Residual Efficacy of Pyrethrin-Methoprene Aerosols to Control Red Flour Beetle and Confused Flour Beetle.” Jim Campbell’s presentation was “Development, Relative Retention, and Productivity of the Red Flour Beetle on Resistant Starches.”

Frank Arthur, Jim Campbell, Paul Flinn, Jeff Lord and Jim Throne attended and made presentations at the Entomological Society of America Annual Meeting, Indianapolis, IN, December 14-16, 2009.

Brenda Oppert attended and made a presentation “Trypsin-like Proteins of the Fungi as Possible Markers of Phytopathogenicity” to the Plant and Animal Genome XVIII Conference in San Diego, January 9-12, 2010.

Frank Arthur attended a meeting of the Food Protection Committee of the International Association of Operative Millers (IAOM) on January 27-29, 2010, in Athens, GA. ARS scientists meet with the committee to report on recent ARS stored-product insect research of interest to the committee and to discuss the grain processing industry’s research needs.



Jim Campbell gave the presentations “Biology of the Top Stored-Product Pests” and “Implications for IPM, and Evaluation of the Efficacy of Stored-Product Insect Pest Management Programs” at the Urban Pest Management Conference held in Lincoln, NE, on February 2-3, 2010.

Frank Arthur and Jim Campbell attended and made several presentations at the NC-213 Marketing and Delivery of Quality Grains Conference in Kansas City, MO, on February 3-4, 2010.

Jim Throne gave a talk "Research Highlights in Stored-Product Entomology" at the Industrial Fumigant Company Technical Training Conference, in Overland Park, KS, February 8, 2010.

Brenda Oppert and Michelle Toutges attended the Advances in Genome Biology and Technology Meeting in San Marco Island, FL, February 23-27, 2010. Brenda Oppert presented the poster "Cysteine Cathepsins in Beetles: Vulnerable Targets for Insect Control?"

Joel Perez-Mendoza gave an invited talk, "Field Testing of Arilon in Kansas" at the DuPont ProBusiness Exchange Arilon Symposium in Naples, FL, March 8-10, 2010.

Jim Campbell gave an invited symposium talk, "Red Flour Beetle Response to Pheromone in Food Facility Landscapes" at the North Central Branch Meeting of the Entomological Society of America in Louisville, KY, March 14-16, 2010.

Jim Campbell was invited by Trece, Inc. to participate in a series of educational seminars for pest control companies and food processors on March 24-26 in Sacramento and Stockton, CA. His presentations focused on the benefits of pheromone monitoring programs, implementation and interpretation of the programs, and evaluating treatment efficacy.

Dick Beeman gave an invited seminar "Beetlemania: Gleanings from the Genome Sequence of *Tribolium castaneum*" on March 26, 2010, at the Department of Entomology, University of Wisconsin, Madison, WI.

Research Highlight

Biology and Control of Psocid Pests of Stored Products

Psocids, or booklice, are emerging pests of stored products, but we know little about them. We are investigating their biology and control to acquire information to help stored-product industries, such as flour mills and warehouses, make decisions about psocid management. These are very small insects, usually less than 1 mm (0.04 inches) in length, which makes them difficult to identify to species.

We first determined which species were present in Kansas, and found that the psocid *Liposcelis entomophila* was the most common species in wheat stored in steel bins and in mills and warehouses, but an additional six species were found: *Liposcelis bostrychophila*, *L. decolor*, *L. paeta*, *L. brunnea*, *L. corrodens*, and *Lepinotus reticulatus*. Psocids usually don't have common names; instead, they are normally referred to by their scientific names.

We found that using small pieces of cardboard (4 X 7 inches) is a good way to collect psocids in grain or mills. We showed that *Lepinotus reticulatus* developed fastest at 30-32°C (86-90°C) and 75% relative humidity, which is common for many psocids, but *Liposcelis brunnea* develops faster at a lower relative humidity. Most people had assumed that psocids only develop at high humidity or in wet grain. Often, it was also assumed that they can't feed on whole grain, but we found that they can feed on and damage whole grain.



The preferred grain varies with species; for example, wheat and barley were the most suitable of six grains for *Liposcelis entomophila* population growth, while oats were most suitable for *Lepinotus reticulatus*. Corn is generally a poor crop for supporting growth of psocids. Heat is being used more often to disinfest flour mills, and we showed that *Liposcelis entomophila* and *Lepinotus reticulatus* are susceptible to heat. We tested all insecticides registered for stored wheat, rice, and corn in the U.S. for efficacy against psocids, and found that the organophosphate insecticides were most effective for psocid control.

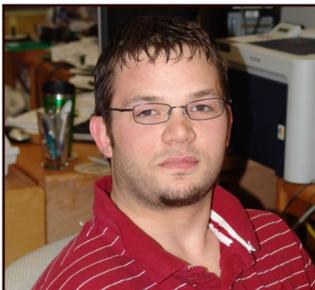
Effectiveness of methoprene, spinosad, and pyrethrin varied with the grain on which they were tested and with psocid species and stage (egg, nymph, or adult). We showed that the fumigant sulfuryl fluoride will kill psocids, and that eggs are the most tolerant stage. Currently, we are testing attractants for psocids, and looking at their movement in grain in response to temperature and moisture gradients.

Center News

New Faces



Emily Jenson is back at CGAHR to work as a post-doc under the supervision of Frank Arthur. After leaving SPIRU as a graduate student and student worker, she decided she wanted to get industry work experience and started working as a consultant. As a post-doc, she is currently working with aerosols and contact insecticides.



Brad Jepson is the new face in the IT office. He is currently keeping busy upgrading the antivirus software and helping with domain migration. He is originally from Manhattan and will soon be a student at K-State majoring in Technology Management.



Joel Perez Mendoza is currently a Research Entomologist doing research with red flour beetles under the direction of Jim Throne. Before coming to CGAHR, he was the Technical Training Director at a private pest control business in Topeka.



Tracey Stockert has joined our Location Support Staff as the new Purchasing Agent. She decided to come to CGAHR after working for a contractor on Fort Riley. She has previous purchasing experience and thought she might like the change. Stockert is currently keeping busy with training and procurement.

Personnel News

Mike Pumphrey has left HWWGRU to take a position at Washington State University. He is their new Research Geneticist working with spring wheat breeding and genetics.

Zoran Ristic, Research Physiologist in the Hard Winter Wheat Genetics Research Unit, passed away in October 2009, after a prolonged illness. He joined the Unit in 2005. Zoran's work focused on tolerance to heat stress in wheat. He was internationally known for his work on the heat tolerance chaperone protein, EF-Tu. He also developed new methods to quantify stress tolerance and discovered several new germplasm lines with increased heat tolerance. His passing is mourned by friends and colleagues.

Scott Bean was named Scientific Advisor to the Celiac Sprue Association.